

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

In the Matter of	)	
	)	
Reallocation of the 216-220 MHz	)	WT Docket No. 02-8
1390-1395 MHz, 1427-1429 MHz	)	RM-9267
1429-1432 MHz, 1432-1435 MHz,	)	RM-9692
1670-1675 MHz and 2385-2390 MHz	)	RM-9797
Government Transfer Bands	)	RM-9854

**REPLY COMMENTS OF CORNELL UNIVERSITY**

Cornell University hereby submits its Reply Comments in response to the Commission's February 6, 2002 Notice of Proposed Rulemaking in the above-captioned docket ("NPRM"). Herein, Cornell supports the Comments filed by the National Research Council's Committee on Radio Frequencies (hereinafter, "CORF"), and also suggests that any rules enacted in this proceeding for operation of 1.4-1.6 GHz facilities reflect the requirement for operators in Puerto Rico to comply with the Puerto Rico Coordination Zone ("PRCZ") requirements in Section 1.924 of the Commission's rules. In addition, Cornell suggests that the Commission's recent concerns about similar proposals in a proceeding on 4.9 GHz are not applicable here. Lastly, Cornell reminds the Commission of the need to protect Arecibo's planetary radar research at 2380 MHz.

**I. Introduction**

Cornell has a substantial interest in this proceeding, as it operates the Arecibo

Observatory (“Arecibo” or “Observatory”) in Arecibo, Puerto Rico. Arecibo is part of the National Astronomy and Ionosphere Center (“NAIC”), a national research center operated under a cooperative agreement with the National Science Foundation (“NSF”). The NSF is an independent federal agency whose aim is to promote scientific and engineering progress in the U.S. Additional funding for Arecibo is provided by the National Aeronautics and Space Administration (“NASA”).

As the site of the world’s largest single-dish radio telescope, Arecibo is recognized as one of the most important centers in the world for research in radio astronomy. Arecibo has been operating since 1963, and in 1997 work was completed on a multi-million dollar upgrade of the facilities, which significantly expanded the range and sensitivity of the observations that could be made, while increasing the shielding around the telescope in an attempt to reduce interference from ground radiation. The telescope now operates up to 10 GHz.

In addition to performing radio astronomy research, the Arecibo Observatory has the most powerful planetary radar facilities in the world, with observations centered at 2380 MHz. Such radar images reveal a wealth of information about the shapes and surface properties of solid bodies in our Solar System. Arecibo has been used to collect data on Mercury, Venus, the moons of Jupiter, and the rings of Saturn, as well as on our own Moon. The radar is also used to study comets, and Arecibo is in a unique position to detect small asteroids that approach the Earth. Funding for such research is provided by NASA and the NSF.

Arecibo has a long history of being the site where very significant accomplishments in astronomy have occurred, including:

- the first discovery of planets outside of our own Solar System;
- discovery of the first pulsar in a binary system, leading to important confirmation of Einstein's theory of gravitational waves and a Nobel Prize for two radio astronomers who performed their research at Arecibo; and
- use of planetary radar to discover the correct rotation rate of the planet Mercury, as well as the discovery of binary asteroids, and discovery of ice in craters on Mercury's polar regions (and similar investigation of the polar regions of the Earth's Moon).

Yet, as the Commission knows, this uniquely important and expensive scientific instrument is extremely vulnerable to interference from unwanted emissions. See, e.g., Radio Astronomy Coordination Zone in Puerto Rico, Report and Order, 12 FCC Rcd 16522 (1997). It is for this very reason that the Commission has enacted Quiet Zone rules specifically protecting Arecibo, and making Arecibo a Quiet Zone Entity. See Section 1.924(d) of the Commission's Rules.

**II. Cornell Supports CORF's Proposals for Protection of Radio Astronomy Observations at 1.4 and 1.6 GHz.**

Very important observations at 1400-1427 MHz and 1350-1400 MHz ("1.4 GHz"), and at 1660-1670 MHz ("1.6 GHz") are regularly performed at Arecibo. Cornell supports the proposals in CORF's Comments designed to protect radio astronomy observations in these bands.

First, Cornell agrees with the CORF proposal (CORF Comments at page 5) that operators of facilities in the 1.4 and 1.6 GHz bands at issue in this proceeding should

have out-of-band emission limits based on the threshold power flux density limits set forth in Recommendation ITU-R RA.769. In support of CORF's assertion therein that many observatories are located within close proximity to highways where it would be reasonable to expect operation of facilities in these bands, Cornell notes that there are heavily traveled roads within four miles (line-of-sight) of the Arecibo Observatory and that the road from the City of Arecibo to the Observatory is lined with houses, schools and businesses, as close as one mile from the Observatory.

Cornell also agrees with CORF's suggestion that as an alternative to use of out-of-band emission limits, protection of radio astronomy observations in the 1.4 and 1.6 GHz bands could be accomplished through use of exclusion and coordination zones. Cornell supports CORF's recommendation that in regards to fixed services, the Commission enact mandatory coordination procedures similar to those already enacted in Sections 1.924(a) and 1.924(d) of the Rules. Cornell recognizes that CORF made a similar proposal in WT Docket 00-32 (4.9 GHz), and that the Commission recently rejected that proposal in paragraph 17 of its Second Report and Order in that Docket (FCC 02-47, released February 27, 2002, hereinafter "*4.9 GHz Second R&O*"). The Commission rejected the proposal in that docket based on the assertion that public safety operations at 4.9 GHz near radio observatories would be unlikely, and that any such operations would be short-term and easy to coordinate on a case-by-case basis. However, even assuming *arguendo* that assertion is true, it does not translate into this proceeding: the 1.4 and 1.6 GHz facilities at issue herein will be commercial operations,

and likely much more ubiquitous than the emergency facilities contemplated in the 4.9 GHz proceeding. Accordingly, the rationale in paragraph 17 of the *4.9 GHz Second R&O* should not determine the results in this proceeding.

Thus, if the Commission does not adopt out-of-band emission levels sufficient to protect radio astronomy observations in the 1.4 and 1.6 GHz bands, then it should consider the use of coordination zones for fixed service operations in these bands within the areas described in footnote US311. Such requirements should apply even if the fixed operations are licensed by geographic area: transmissions from such operations have the same potential for interference as those licensed on a site-by-site basis.

While the proposals stated above are necessary to protect observatories in general from interference from fixed services, at very least, the Commission should recognize the applicability of Section 1.924 of its current Rules to this proceeding. Under Section 1.924 of the Commission's Rules, parties planning to construct and operate permanent fixed stations within zones specified in sub-sections (a) and (d) of that rule must notify the National Radio Astronomy Observatory and Arecibo, respectively, and the rule encourages coordination between the observatory and the applicant. No mention was made of this requirement in the NPRM in this proceeding, yet, there is no basis for excluding fixed 1.4 and 1.6 GHz operations from the requirements of Section 1.924, at least in the absence of enacting other methods for protecting radio astronomy observations.

In regards to protection of radio astronomy observations at 1.4 GHz and 1.6 GHz

from interference from mobile services using the bands discussed herein, CORF recommended that the licenses issued for such services exclude areas nearby the observatories, since coordination with individual mobile handsets is not possible. Cornell supports this approach. As noted by CORF, this licensing rule would be consistent with the approach in US311, in which the Commission is to make “every practicable effort to avoid the assignment of frequencies” in mobile services that could interfere with observations at 1.4 GHz. Again, Cornell recognizes that the Commission rejected a similar proposal in paragraph 17 of the *4.9 GHz Second R&O*. However, as was noted above, given that the 1.4 and 1.6 GHz facilities at issue herein will be commercial operations, and likely much more ubiquitous than the emergency facilities contemplated in the 4.9 GHz proceeding, the rationale in paragraph 17 of the *4.9 GHz Second R&O* should not determine the results in this proceeding. Indeed, as was noted above, the close proximity of the City of Arecibo and its suburbs, combined with the intermittent use and varying distances of mobile users, would present a particularly difficult and harmful RFI environment in the 1.4/1.6 GHz bands.

### **III. Cornell Reminds The Commission of the Need to Protect Planetary Radar Research at 2380 MHz.**

As was noted above, Arecibo has the most powerful planetary radar facilities in the world, with operations centered at 2380 MHz. Cornell is grateful that the Commission has recognized the need to protect the important research performed with these facilities. Specifically, in paragraph 68 of the earlier *Report and Order* (FCC 01-382, released January 2, 2002) that reallocated this band, the Commission noted that

airborne and space-to-Earth transmissions in the 2385-2390 MHz band will be prohibited in Puerto Rico, in order to provide such protection. Cornell did not see any mention of such restrictions in the NPRM, but it assumes that such restrictions will be enacted in final rules for this band. In addition, Cornell also assumes that fixed operations in this band in Puerto Rico will be subject to the coordination requirements of Section 1.924(d) of the Commission's rules. Such protections are necessary and appropriate to provide protection to planetary radar research.

#### **IV. Conclusion**

Some method for protection of radio astronomy observations from harmful emissions by fixed and mobile operations at 1.4 and 1.6 GHz is critically necessary, and indeed mandated by the Commission's rules. Such protection could be accomplished by effective out-of-band emission limits, or by coordination zones for fixed operations and exclusion zones for mobile operations. Lastly, Cornell reminds the Commission of the need to protect Arecibo's planetary radar research at 2380 MHz.

Respectfully submitted,

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